

Benchmark Year in Citizen Science Cloud Observations: *The Good, The Bad, and The Inspiring!*

Jessica Taylor, Langley Science Education Lead,
jessica.e.taylor@nasa.gov

Discussion Points

- Update - CERES FM6 Communication Plans
- Highlights & Accomplishments
- Merger of S'COOL and GLOBE
- The GLOBE Program Potential

CERES FM6 Communications Plans

- CERES story corps videos/interviews
 - Working with team to identify pairs of alumni and early career to discuss CERES on camera
- Employee Profiles leading up to launch on NASA.gov
- Making CERES/Eclipse (Earth's Energy Budget) connections in feature/visuals for NASA.gov and social media
- Plan to update mission overview video
- *Do you have older CERES photos that may not be archived at NASA?*
Please send those to Denise Lineberry,
denise.a.lineberry@nasa.gov

People to Know

- Joe Atkinson, NASA Langley Public Affairs,
joseph.s.atkinson@nasa.gov
- Denise Lineberry, NASA Langley Science Directorate
Communications lead,
denise.a.lineberry@nasa.gov
- Kristyn Damadeo, RBI Communications Lead,
kristyn.damadeo@nasa.gov

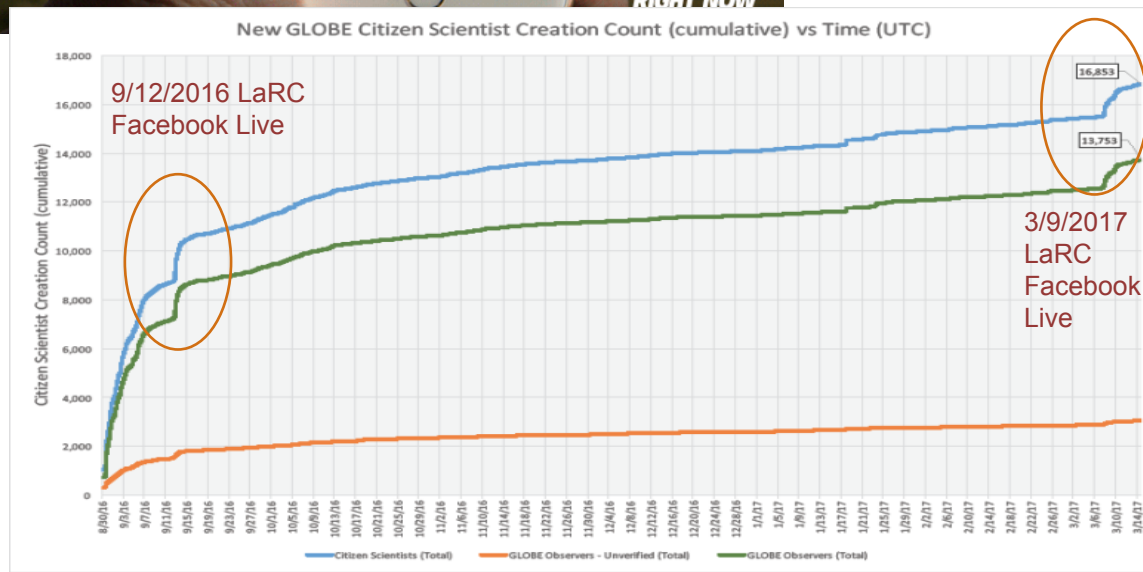
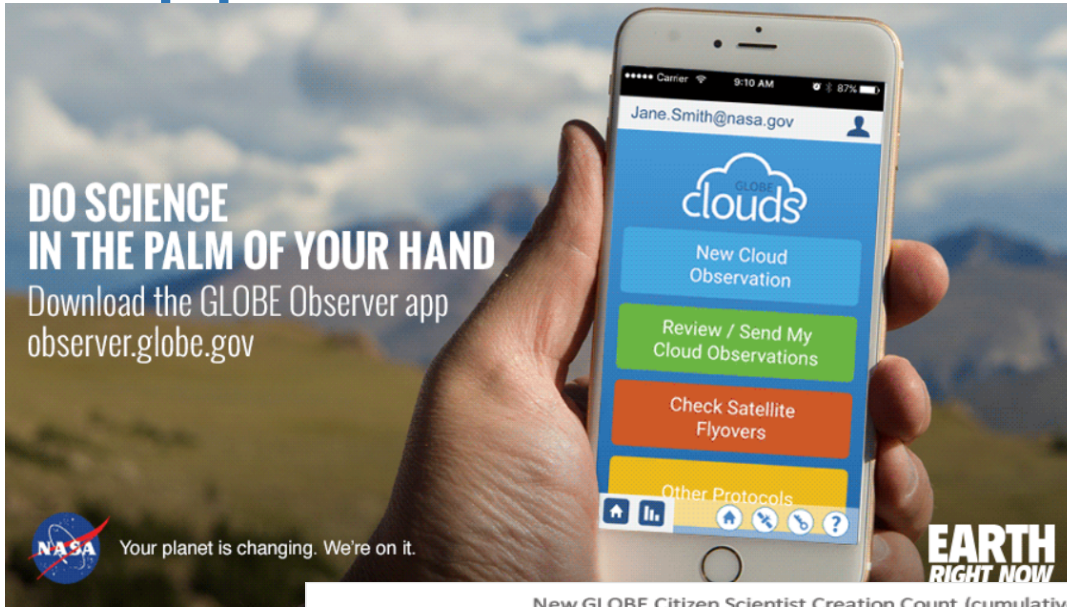
The Good



And The Bad



Highlights: NASA's GLOBE Observer App



Highlights: S'COOL Program Milestone

ARTICLES

CERES S'COOL PROJECT UPDATE

The Evolution and Value of a Long-Running
Education Project with a Foundation in
NASA Earth Science Missions

LIN H. CHAMBERS, MEGAN A. McKEOWN, SARAH A. McCREA,
ANN M. MARTIN, TINA M. ROGERSON, AND KRISTOPHER M. BEDKA

Since 1997, S'COOL has engaged interested participants worldwide in observing clouds and comparing data from ground and satellite sources to inform validation efforts for several NASA Earth science missions.

Scientists are increasingly interested in crowd-sourced data but have concerns about its accuracy. Begun nearly 20 years ago, the Students' Cloud Observations Online (S'COOL) project, introduced to BAMS readers in Chambers et al. (2003), offers a unique opportunity to inform this question. S'COOL arose from a confluence of education and science needs. Teachers are able to engage students in real-world science, while NASA obtains extensive ground-

based data on clouds. Here we examine the record of participation and the information gathered to assess the value of crowd-sourced Earth system data and to illuminate important considerations for scientists considering involving a wider community in their work.

Imager-based cloud retrievals (cloud/no cloud and cloud properties such as phase, optical depth, and height) are some of the foundational data sources used to determine scene characteristics within each footprint of the Clouds and the Earth's Radiant Energy System (CERES; Wielicki et al. 1996) instrument. This information is needed to analyze the radiation balance throughout the day, a precursor to understanding the Earth radiation budget (ERB) at climatological time scales (Loeb et al. 2009). Thus, it is very important to understand the accuracy of cloud retrievals as biases can influence the CERES-derived ERB. Meanwhile, students in classrooms around the world learn about clouds and the scientific process as part of the school curriculum, and many adults observe the sky individually or through hobby clubs and organizations. S'COOL connects these interests by engaging students and others in cloud observations and analysis.

AFFILIATIONS: CHAMBERS AND BEDKA—Science Directorate, NASA Langley Research Center, Hampton, Virginia; McKEOWN—Texas A&M, College Station, Texas; McCREA, MARTIN, AND ROGERSON—Science Systems and Applications, Inc., Hampton, Virginia
CORRESPONDING AUTHOR E-MAIL: Lin H. Chambers, lin.h.chambers@nasa.gov

The abstract for this article can be found in this issue, following the table of contents.

DOI:10.1175/BAMS-D-15-00248.1

In final form 27 June 2016
©2017 American Meteorological Society

AMERICAN METEOROLOGICAL SOCIETY

MARCH 2017 BAMS | 473

150,000
Observations!



- BAMS Article: <http://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-15-00248.1>

Highlights: Merging S'COOL and GLOBE

April 24, 2017

Two NASA Programs Join Forces to Better Understand Earth's Changing Environment



cameras, camcorders and scanners, can replace x-ray-sensitive film used for mammography by converting x-rays into light, then into electronic signals which are then changed into images and stored in a computer.

The mammography unit developed using CCDs, computers and

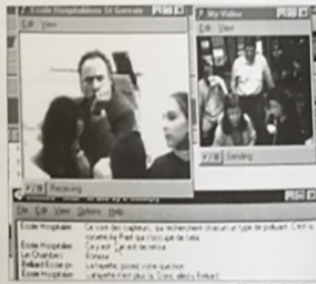
reveal fine detail in the breast; in fact, some have even detected tumors as small as 0.2 mm, about the thickness of a piece of thread. Digital mammography aims to identify those as small as 0.1 mm.

This is an example of "technology twice used," where the techniques used to monitor the atmosphere and help

health. Major areas of concern are cancer, reproductive health, pregnancy, osteoporosis and education.

The technologies include the new robotic "Smart Surgical Probe"; technology to allow three-dimensional "planning" for breast reconstruction, as is currently done for facial reconstruct-

NASA's Goddard Space Flight Center, Greenbelt, Md., provided information on the way technology allowing the Hubble Space Telescope to map distant stars is being used in doctors' offices today to easily detect tiny spots in breast tissue, using a needle for biopsy rather than surgery.



Photos by Jeff Caplan

WORLDWIDE WEATHER WATCHERS — Left: Lin Chambers, of the Radiation Sciences Branch, communicates through a video camera over the World Wide Web with students from a French elementary school as part of the Students' Cloud Observations Online Program, in the last phase of its first year. The program allows kids from 30 schools around the world to ask NASA scientists questions about weather and climate. The Langley Distributed Activities Archive Center also helps with the program. Looking on is Stephanie Weckmann, a senior research associate with Virginia Polytechnic Institute and State University, and David Young, of the Radiation Sciences Branch.

Above: Students see this screen when talking on line to NASA scientists.

November 7, 1997 ♦ Researcher News ♦ Page

In this clip from a 1997 copy of the Researcher News, Lin Chambers (foreground), Dave Young (standing, arms crossed) and other members of the S'COOL team chat with a S'COOL participant in France.

Credits: NASA



Things are looking up. Observe clouds today with our newly updated protocol.

- NASA.gov Feature: <https://www.nasa.gov/feature/langley/two-nasa-programs-join-forces-to-better-understand-earth-s-changing-environment>

S'COOL Observations



Observation Date	S'COOL Obs	ROVER Obs	Total S'COOL	GEO	AQUA	TERRA	CALIPSO	Total Sat Matches
Jan	556	170	726	551	135	120	0	806
Feb	602	77	679	528	131	107	0	766
Mar* (offline 20+ days)	316	49	365	235	62	54	0	351
Apr	368	98	466	318	72	37	0	427
Total	1842	394	2236	1632	400	318	0	2350

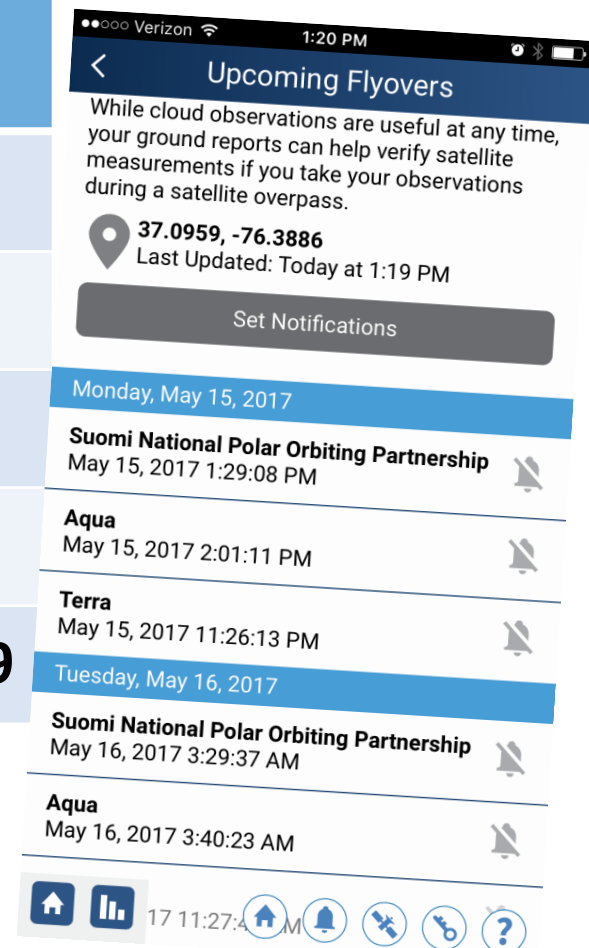
GLOBE - Expanded Reach of Citizen Science Cloud Observations



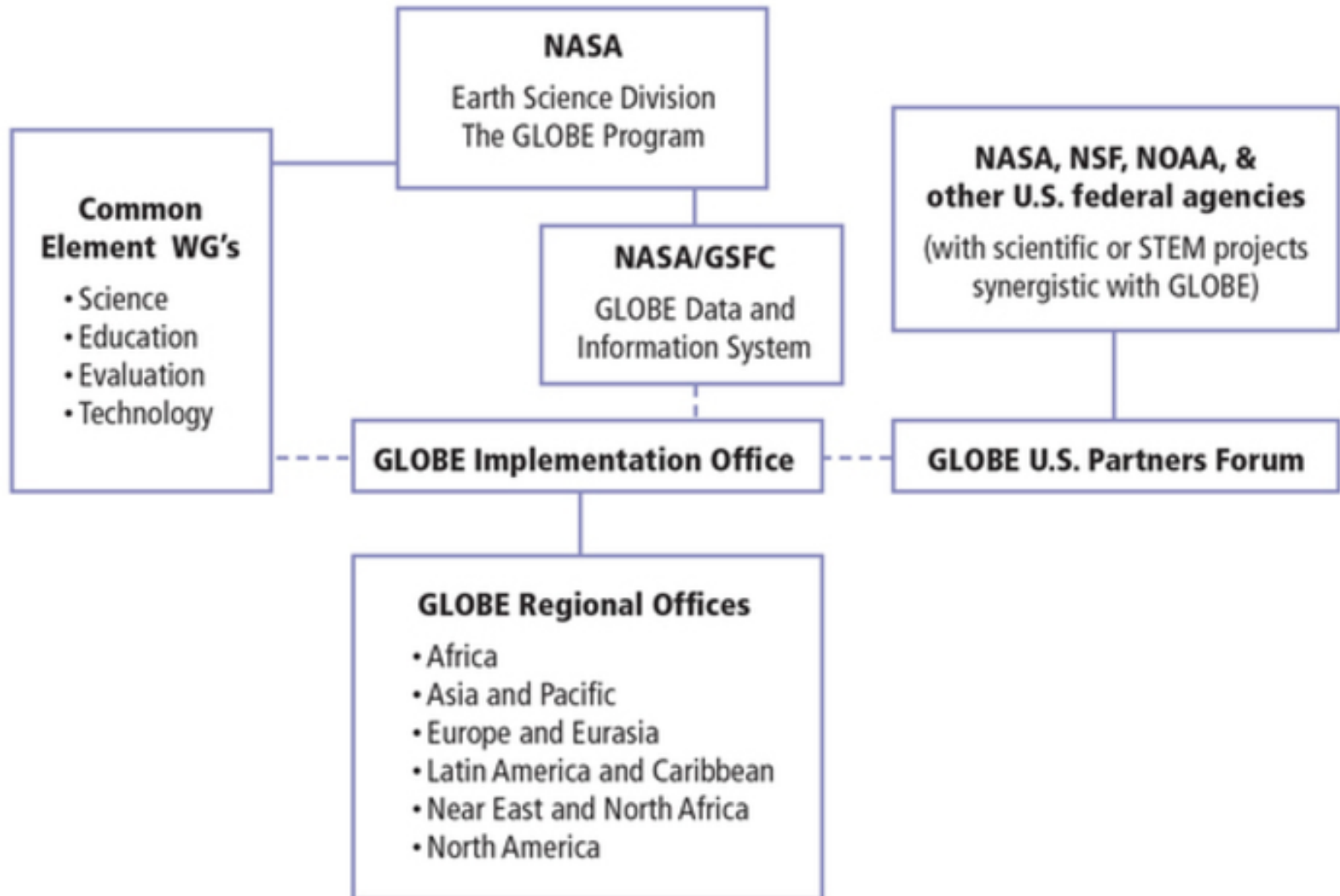
Observation	Non-Trained Citizen Science	Trained Citizen Science	Total
Jan	1,456	7,027	8,483
Feb	1,668	6,835	8,503
Mar	3,318	5,957	9,275
Apr	2,223	3,952	6,185
Total	8,665	23,771	32,446

GLOBE Cloud Satellite Matches

Observation	GEO	Terra	Aqua	CALIPSO	Total
Jan	4,317	632	773	1	5,723
Feb	2,756	654	769	0	4,179
Mar	4,916	625	868	2	6,411
Apr	4,008	592	482	4	5,086
Total	15,997	2,503	2,892	7	21,399



Our Expanded Stakeholders



Example GLOBE Activities

- Scientists' Blogs
- Scientist-led Intensive Observation Periods
- Existing databases
- Proactive App development
- Teacher Training
- Local Student Research Symposiums
- Virtual Student Science Symposiums



The Inspiring



Why we love GLOBE



GLOBE Student Research Experience 2016

<https://www.youtube.com/watch?v=3aTQtoPD7dE>

Thank you

If you have any questions or would like to become involved in education and outreach, please feel free to contact me at jessica.e.taylor@nasa.gov

Why we love GLOBE



US Regional Science Fair at NASA JPL

<https://www.youtube.com/watch?v=kfGtjht7poc>